The Underlying Mechanisms Related to Social Connectedness Derived from Facebook

Anna Wade

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Statement of Sources

I declare that this report is my own original work and that contribution of others have been duly acknowledged.

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Investigating Social Connectedness derived from Facebook features, and the associated psychological outcomes: An Exploratory Factor Analysis

Anna Wade

University of Tasmania, Hobart

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Abstract

As a concept embedded in belonging, the beneficial outcomes associated with social connectedness are well demonstrated in previous research. The current research investigated whether social connectedness is derived from specific features within Facebook. Participants (N = 354) were Facebook users over the age of 18, who completed an online survey assessing Facebook feature social connectedness, and psychological wellbeing (e.g. depression, anxiety, and life satisfaction). Exploratory factor analysis (Maximum Likelihood with Direct Oblimin rotation) revealed seven distinct yet related factors, including face-to-face social connectedness, liking-derived connectedness, wall posting-derived connectedness, and Messenger-derived connectedness. Results of subsequent bivariate correlational analysis revealed that social connectedness derived from liking, Messenger, and to a lesser extent wall posts, was modestly but significantly associated with psychological wellbeing. The results have various theoretical and practical implications. Despite the cross-sectional design preventing causal inferences to be drawn, the current study contributes to our understanding of how belongingness needs can be met on Facebook via specific features, and the psychological experiences associated with this sense of connectedness. Future research implementing a longitudinal design is needed in order to determine causation, assisting researchers to make more conclusive interpretations about potential practical applications of the findings in clinical settings.

The use of the Internet for social purposes is becoming increasingly widespread (Kraut & Burke, 2015). Understanding the processes involved in facilitating interpersonal closeness among individuals online, and the associated psychological outcomes, is therefore valuable. Traditionally fulfilled in face-to-face interactions, belongingness theory says that individuals have an inherent need to belong, and that a sense of social connectedness satisfies this need (Baumeister & Leary, 1995). Social connectedness can also be obtained via social networking sites (SNSs) such as Facebook (e.g. Grieve, Indian, Witteveen, Tolan, & Marrington, 2013). Further, online derived social connectedness is associated with positive psychological outcomes (e.g. Challands, Lacherez, & Obst, 2017; Grieve et al., 2013; Hu, Kim, Siwek, & Wilder, 2017; Townsend, Wallace, Smart, & Norman, 2016). Previous research has investigated Facebook social connectedness as a whole entity, ignoring the unique forms of interaction provided by underlying Facebook features (Antheunis, Vandeen Abeele, & Kanters, 2015). Given the omnipresent use of Facebook in everyday life, and based on the identified gap in the literature, the aim of the current study was for the first time, to investigate the specific features that facilitate social connectedness on Facebook, and the psychological outcomes linked to their use.

An Inherent Need to Belong

Social capital is defined as the social connections that provide resources, knowledge, and opportunities to the individual and collective **(**Cozzolino, 2011; Morris & Pfeiffer, 2017). Two main forms of social capital exist: bonding social capital, and bridging social capital. Bonding social capital is characterised by strong ties, emotion, and intimacy within relationships (Liu & Brown, 2014). Bonding

social capital involves ties such as intimate partners, close friends, and immediate family. Bridging social capital is characterised by weaker ties and less intimacy in relationships. Despite being characterised by a lower degree of closeness, bridging social capital plays an important role in providing informational support (Coleman, 1988), and connecting individuals with their broader social network (Liu & Brown, 2014). Characterised by trust and reciprocity, social capital is instrumental to one's sense of belongingness (Morris & Pfeiffer, 2017).

Social connectedness is a form of bonding social capital (Morris & Pfeiffer, 2017; Sinclair & Grieve, 2017). Social connectedness may be defined as the feeling of interpersonal closeness and belonging acquired through one's social network **(**Baumeister & Leary, 1995; Lee, Draper, & Lee, 2001). The concept of social connectedness originates from the theory of belonging. Belongingness theory describes the inherent desire of humans to experience closeness and inclusion in their social surrounds (Baumeister & Leary, 1995).

Satisfying belongingness needs requires deeper interaction beyond mere contact with others (Baumeister & Leary, 1995). Social connectedness is framed in terms of subjective quality of relationships (Baumeister & Leary, 1995; Lee et al., 2001). The subjective nature of social connectedness means that not all individuals with social resources and supportive social networks will avoid experiences of loneliness and isolation (Lee & Robbins, 1995). Measures of social connectedness therefore provide an indicator of one's perceived ability to attain feelings of affiliation and belongingness from their social network (Riedl et al., 2013).

When belongingness needs are met, many positive outcomes prevail, enabling individuals to perform closer to their optimum (Baumeister & Leary, 1995). Consistent with belongingness theory, the benefits of social connectedness obtained

from face-to-face interactions are well established. Social connectedness has been linked with lower rates of anxiety in women (Lee & Robbins, 1998). Female participants completed measures of social connectedness, social support, self-esteem, and state-trait anxiety. Hierarchical multiple regression analysis revealed that social connectedness explained a larger proportion of variance in trait anxiety when compared to the individual and collective influence of social support and self-esteem. Lee and Robbins (1998) concluded that within clinical contexts, addressing a client's level of social connectedness would be effective when treating anxiety.

Social connectedness has also been examined in domain-specific studies. Cockshaw and Shochet (2010) investigated whether workplace belongingness acted as a protective mechanism against symptoms of depression and anxiety. Correlational analysis revealed that higher levels of workplace connectedness were significantly associated with lower symptoms of depression. Similarly, Cockshaw, Shochet, and Obst (2014) investigated whether workplace belongingness was conceptually discrete to general belongingness using a cross-lagged longitudinal design. Structural equation modelling was performed on data obtained from measures of general and workplace-specific belongingness. A two-factor solution emerged, illustrated by strong, yet discrete loadings on workplace belongingness and general belongingness. Furthermore, higher levels of workplace belongingness were associated with lower levels of depression among participants. Workplace connectedness therefore represents a distinct concept that has positive effects psychologically.

Similarly, the concept of school connectedness has been linked to lowered depressive symptoms. Adolescent school connectedness has been shown to partially mediate the relationship between classroom environment and depressive symptoms,

as concluded from three measurements obtained over an 18-month period (Shochet & Smith, 2014). Other research has found that social connectedness is associated with indicators of psychological wellbeing in various social groups. For example, the association between feelings of belongingness and subjective wellbeing has been demonstrated among immigrants (e.g. Yoon & Lee, 2010), volunteers (Brown, Hoye, and Nicholson, 2012), and adolescents (e.g. Yildiz, 2015). Similarly, the link between higher levels of social connectedness and lower levels of depression has been demonstrated among rural residents (e.g. Galloway & Henry, 2014).

Overall, these studies demonstrate how meeting belongingness needs in a range of social contexts is associated with positive outcomes related to wellbeing. It is important to note however, that causality cannot be inferred from cross-sectional designs (e.g. Cockshaw and Shochet, 2010; Lee and Robbins, 1998). It is feasible that individuals experiencing anxiety and low self-esteem might have withdrawn from social interactions that would provide the opportunity to experience social connectedness. Alternatively, there might be a bidirectional relationship between the constructs. Despite these limitations, the discussed conclusions are consistent with the causal effects proposed in Baumeister and Leary's (1995) belongingness theory, whereby increases in belongingness drive increases in positive psychological wellbeing. Beyond depicting a relationship however, the use of longitudinal research design (e.g. Cockshaw et al., 2014; Shochet & Smith, 2014) enables researchers to determine the direction of the relationship between social connectedness and psychological wellbeing. A causal effect is thus apparent, whereby high levels of social connectedness precede positive psychological health.

Deriving Social Connectedness Online

Investigation of the concept of social connectedness initially involved the study of face-to-face social interactions (Riedl, Kobler, Goswami, & Krcmar, 2013). Over the last decade numerous technological developments, including SNSs, have necessitated re-examination of concepts embedded in belongingness theory (Lee, Kim, & Ahn, 2014; Riedl et al., 2013). The use of the Internet for social purposes continues to evolve. The progression of SNS is demonstrated not only in the number of users and online platforms, but also in the nature of its use (McClosekey, Iwanicki, Lauterbach, Giammittorio, & Maxwell, 2015). Most notable, the emergence of Facebook in 2004 introduced major changes at the individual, group, and societal level of social interaction (Nadkarni & Hofmann, 2012). The current usage figures make Facebook the most used SNS, with 1.32 billion daily users (Facebook Newsroom, 2017). With the popularity of SNSs continuing to grow, it is essential that research about its use remains up-to-date (Phua, Jin, & Kim, 2017).

Facebook activity primarily centres on the motivation to establish and enhance interpersonal relationships (Utz, 2015), making the theory of belongingness an appropriate investigatory framework. Grieve et al. (2013) investigated whether social connectedness derived from Facebook was conceptually separable from social connectedness derived from face-to-face interactions. Participants (N = 344) completed an online survey comprised of the Social Connectedness Scale –revised (Lee, Draper, & Lee, 2001), and Facebook social connectedness, measured with an adapted version Lee et al.'s scale (Grieve et al., 2013). Exploratory factor analysis (EFA) revealed two factors. The first factor related to offline social connectedness experienced from face-to-face interactions. The second factor represented social connectedness derived from Facebook, with correlations between the factors

suggesting that the factors were distinct but related. Grieve et al. (2013) therefore concluded that social connectedness could be derived from Facebook.

Grieve et al. (2013) extended their research to examine how Facebook use was associated with depression, anxiety, and subjective wellbeing. Correlational analysis revealed that Facebook use was associated with lower rates of anxiety and depression, and enhanced life satisfaction. Therefore, despite being conceptually different, it was concluded that Facebook connectedness was associated with similar positive psychological outcomes as face-to-face forms of social connectedness (Grieve et al., 2013).

Sinclair and Grieve (2017) investigated whether older adults who were active on Facebook experienced social connectedness from the SNS. In line with previous research, EFA revealed that online and offline social connectedness were distinct yet correlated constructs. Participants also reported similar levels of social connectedness as younger populations, demonstrating that older adults are capable of experiencing social connectedness on Facebook.

There are a number of studies providing additional evidence for social connectedness derived online, and for the psychological benefits that are associated with belongingness online. For example, participation on Twitter has been linked with feelings of social connectedness and closeness (Lin, Levodashka, & Utz, 2016; Riedl et al., 2013), while Snapchat use has been linked with high levels of bonding social capital (Phua et al., 2017). Hu et al. (2017) found that American college students connected to Facebook exhibited general psychological wellbeing and life satisfaction. A link between online social connectedness and low depression and anxiety has been demonstrated in rural settings (Townsend, Wallace, Smart, & Norman, 2016**)**, while general feelings of social connectedness online have been

shown to moderate depressive symptoms associated with driving cessation among older adults (Challands, Lacherez, & Obst, 2017).

It is therefore evident that the well-known benefits derived from face-to-face social connectedness, including satisfaction with life, and reduced depression and anxiety, translate to the Facebook context. Overall, there is substantial evidence to suggest that social connectedness derived from online sources may act as a protective factor against symptoms of depression and anxiety, while promoting subjective wellbeing. Studies such as these demonstrate that Facebook is a viable platform for the accumulation of social capital and feelings of connectedness (Phua, Jin, & Kim, 2017).

The Potential Role of Facebook Features in Facebook-derived Social Connectedness

Existing literature has predominately focused on Facebook as a whole entity (e.g. Grieve et al., 2013; Sinclair & Grieve, 2017. Expanding research to investigate the specific features that facilitate Facebook connectedness is therefore valuable (Wohn, Carr, & Hayes, 2016). Facebook is comprised of a number of advanced features that enable users to interact with friends in unique ways (Park, Chung, & Lee, 2012). Facebook Messenger, 'liking', commenting, wall posting, and status writing represent some of the features that are central to the Facebook experience. Facebook Messenger is a chat forum whereby users can communicate online with friends, either individually or in groups. The commenting feature on Facebook enables users to remark on friends' content (such as photo shares and status updates). The 'liking' feature appears as a 'thumbs-up' symbol indicating a positive reaction to another's content. Wall posting involves writing a personalised message on a friend's profile, appearing on a bulletin style 'wall'. Status writing refers to when a user

shares an announcement, opinion, or anecdote that appears on the user's own profile wall, and in their friends' newsfeed (Nadkarni & Hofmann, 2012).

Facebook features can be distinguished according to three main characteristics: directed communication versus broadcasting; public versus private communication; and passive versus active forms of interaction (Antheunis, Vandeen Abeele, & Kanters, 2015). Directed communication refers to communication that is targeted toward a certain friend, such as posting on a Facebook friend's wall or sending a direct Facebook Messenge. Alternatively, broadcasting is reflected in status writing, where by not one Facebook friend or group is targeted. Private communication refers to personal forms of interaction separate from shared viewing, primarily illustrated in Facebook Messenger. Public forms of communication on Facebook are not necessarily open to the public beyond one's Facebook friends. Instead, the term 'public' refers to content that is public in terms of *all* of an individual's Facebook friends being able to view the material (Antheunis et al., 2015).

While markedly understudied, there are a small number of studies that have investigated the influence of specific Facebook features in relation to social capital. Burke, Marlow, and Lento (2010) investigated how the use of directed Facebook features related to social capital among 1193 participants. Results of a regression analysis revealed that directed Facebook activities (e.g. Messenger, 'liking', wall posts, and commenting) were positively associated with bonding and bridging social capital. The relationship between directed Facebook features and bonding social capital was stronger than the relationship with bridging social capital. Follow-up longitudinal research was conducted eight months later to identify causal effects between the use of Facebook features and social capital (Burke, Kraut, & Marlow,

2011). The results of a regression analysis revealed that both direct, and indirect (e.g. status writing, photo sharing) Facebook features were positively associated with bridging social capital. Unanticipated was that no substantial links to bonding social capital were observed.

Similarly, Lee et al. (2014) explored the relationship between the use of specific features and bonding and bridging social capital. Participants (N = 287) completed an online survey measuring their frequency of Facebook feature use, bridging social capital, and bonding social capital. Results of a multiple hierarchical regression revealed that the frequent use of 'liking' was significantly and positively associated with bonding social capital, while commenting was significantly and negatively associated with bonding social capital. Lastly, the frequent status writing has been linked to increases in social connectedness among 109 Facebook users (Kobler, Riedl, Vetter, Leimeister, & Krcmar, 2010).

The inconsistency of some of the discussed research, including the absence of an observed relationship between forms of direct Facebook communication and bonding social capital (e.g. Burke et al., 2010**;** Burke et al., 2011), is likely the result of the studies being somewhat outdated. Growing familiarity with Facebook as a conventional form of communication has precipitated considerable change in the way individuals interact (McCloskey et al., 2015), and presumably the degree of bonding social capital associated with its use. Despite the limitations, feature-specific research illustrates that not all Facebook features are associated with an equal potential to promote bonding social capital (Sheer & Rice, 2017**).**

As a directed Facebook feature, 'liking' and its link to feelings of interpersonal closeness has been investigated (Burke & Kraut, 2016). There is evidence that Facebook 'liking' acts as a Paralinguistic Digital Affordance (PDA).

PDAs are simple forms of social interaction that do not involve the use of formal written language (Hayes, Carr, & Wohn, 2016). The 'liking' feature on Facebook has been linked with the maintenance of social relationships (Eranti & Lonkila, 2015), perceived social support, and low levels of loneliness among individuals high and low in self-esteem (Wohn et al., 2016). PDAs have also been shown to promote positive emotions and feelings of closeness (Rodriguez-Hidalogo, Tan, & Verlegh, 2017). Exploring the relationship between Facebook 'liking' and social connectedness may therefore provide worthwhile information regarding its unique role in facilitating interpersonal belonging.

Longitudinal research by Kraut and Burke (2015) examined the relationship between the use of certain Facebook features and users' psychological wellbeing. Survey data from 1927 participants was obtained at three times points. The results confirmed predictions; the use of Facebook features directed at one individual (e.g. Facebook Messenger, commenting, and wall posts) was related to higher levels of perceived social support and happiness, and reductions in symptoms such as depression and stress. Longitudinal research such as Burke et al. (2011) and Kraut and Burke (2015) substantiates evidence of a causative relationship between the use of directed Facebook features, social capital, and psychological wellbeing.

The Current Study

In summary, belongingness theory says that people have a fundamental need to belong (Baumeister & Leary, 1995), and that this need can be met via social connectedness (Baumeister & Leary, 1995; Lee et al., 2001). Social connectedness from traditional social networks is associated with positive psychological outcomes, such as reduced depression (e.g. Cockshaw et al., 2014; Shochet & Smith, 2014) and lower anxiety (e.g. Lee & Robbins, 1998). Importantly, social connectedness can

also be obtained online (e.g. Grieve et al., 2013; Lin et al., 2016; Sinclair & Grieve, 2017), and this online derived social connectedness is also associated with positive psychological outcomes (e.g. Challands, Lacherez, & Obst, 2017; Grieve et al., 2013; Hu et al., 2017; Townsend et al., 2016).

Although research suggests that social connectedness can be derived from Facebook (e.g. Grieve et al., 2013), it is predicated on the idea of Facebook as a unitary entity, when in fact there are numerous ways in which Facebook can be used to facilitate social interaction, due to the various features it offers (Kraut & Burke, 2015). Mindful that other research has noted that Facebook features differ in terms of their contribution to bonding versus bridging social capital (e.g. Burke et al., 2010; Burke et al., 2011; Lee et al., 2014), it is important to investigate exactly which Facebook features allow social connectedness to be derived, (and to what extent). This is particularly relevant considering how popular Facebook has become (Kraut & Burke, 2015), with the number of daily users more than doubling since 2010 (Facebook Newsroom, 2017).

There were two objectives of the current research. In order to develop a more comprehensive understanding of the mechanisms that facilitate social connectedness on Facebook, the first aim of the study was to investigate whether various Facebook features (Messenger, commenting, 'liking', wall posts, and status-writing) promote distinct forms of social connectedness. The selection of features was based on their coverage of directed, private and public, and active forms of communication, in addition to high frequency of use (Antheunis et al., 2015; Lee et al., 2014).

Within the context of belongingness theory, the current study builds on extant research suggesting that social connectedness obtained online provides similar psychological benefits to social connectedness obtained in traditional (face-to-face)

interactions (Grieve et al., 2013; Kraut & Burke, 2015) The second aim of the study was to examine the relationship between feature-derived social connectedness factors, and depression, anxiety, stress, social anxiety, subjective wellbeing, perceived social support, and subjective happiness.

Hypotheses

To address the first aim of the study, EFA investigated the extent to which social connectedness derived from different Facebook features (Messenger, liking, commenting, wall posts, and status writing) would emerge as distinct, but correlated constructs. Informed by research implying that bonding social capital is promoted to different degrees depending on the Facebook feature used (Burke et al., 2010; Burke et al., 2011; Lee at al., 2014), it was anticipated that several factors of feature-specific social connectedness would emerge. Furthermore, it was anticipated that the factor structure would reveal Messenger-derived connectedness items as loading most strongly to its corresponding factor, due to the directed and private nature of Messenger communication (e.g. Antheunis et al., 2015). Commenting, liking, wall posting, and status writing were anticipated to demonstrate lower factor loadings due to their reflection of more casual, entertaining forms of interaction (Lee et al., 2014). Despite predicted lower associations, the 'liking' feature on Facebook is expected to represent a distinct form of social connectedness due to its function as a PDA (Wohn et al., 2016).

To address the second aim of the study, bivariate correlations were conducted between the Facebook feature derived social connectedness factors that emerged in the EFA (per the first aim of the study). The benefits of social connectedness have been demonstrated in numerous domains, including online social contexts (e.g. Grieve et al., 2013; Hu et al., 2107; Kraut & Burke, 2015; Townsend et al., 2016),

and among various social groups (e.g. Lee & Robbins, 1998; Sinclair & Grieve, 2017; Yoon & Lee, 2010). Based on such findings, and the mechanisms described by belongingness theory (Baumeister, & Leary, 1995), it was anticipated that Facebook feature-derived social connectedness would similarly be related to positive psychosocial outcomes.

Although specific *a priori* predictions about individual factors were not possible due to the use of EFA, some tentative hypotheses were generated. Given that social connectedness is a form of bonding social capital, and in light of research by Kraut and Burke (2015), it was predicted that social connectedness derived from the use of Facebook Messenger would be associated with the lowest levels of anxiety, stress and depression, and highest levels of perceived social support, subjective wellbeing and happiness. As wall posting, commenting, 'liking', and status writing tend to reflect aspects of bridging social capital (Burke et al., 2010; Lee et al., 2014), social connectedness derived from these features were also predicted to be associated with lower depression, stress, and anxiety, and greater levels of perceived social support, subjective wellbeing and happiness, but that these relationships would be attenuated relative to those derived from Messenger.

Finally, it was predicted that a measure of participant's 'actual' number of Facebook friends would share stronger relationships with the discussed psychological measures, when compared to participants' total number of Facebook friends. The prediction was based on previous research suggesting that Facebook users' number of 'actual' Facebook friends is more predicative of bonding social capital (Ellison, Steinfield, and Lampe, 2011).

Method

Participants

Participants (*N* = 354; 269 female; 83 male; 2 unspecified) were recruited according to the selection criteria specifying that they must be Facebook users and over the age of 18. The average age of participants was 25.23 years (*SD* = 9.80). Within the sample, 299 individuals attended University at the time of the study.

Design and Analytical Approach

The study followed a cross-sectional correlational design. The first aim of the study was addressed using EFA. Items assessing offline social connectedness, Facebook connectedness, Facebook Messenger-derived connectedness, liking-derived connectedness, commenting-derived connectedness, wall posting-derived connectedness, and status writing-derived connectedness were analysed to examine the underlying latent structure of the variables assessing social connectedness (Flora & Flake, 2017), and thus whether the assessed variables would emerge as separable constructs. The extent to which each variable 'loads' to an underlying factor is determined by modelling the common variance present in the set of variables (Howard, 2016). Maximum Likelihood extraction methods were used to ensure the greatest generalisability of the results (Howard, 2016). Direct Oblimin (Oblique) rotation was performed on the final model due to the anticipated degree of correlation between constructs (Tabachnick & Fidell, 2007).

Building on the findings from part one of the study, a bivariate correlational analysis was performed on the variables that emerged from the EFA, in addition to stress, depression, anxiety, social anxiety, subjective wellbeing (life satisfaction), subjective happiness, and perceived social support.

***a priori* data analysis**. *a priori* power analysis was performed to ascertain the required sample size to ensure the probability of Type-1 and Type-2 errors was sufficiently reduced (Mayr, Erdfelder, Buchner, & Faul, 2007). According to Cattell's (1978) guidelines for factor analysis, a participant-to-item-number ratio of between 3:1 and 6:1 is recommended to ensure accurate interpretations regarding the number and nature of unobservable factors in the date set. The initial EFA was performed on 140 items, suggesting a participant number between 420 and 840 was required. The final EFA was performed on 100 items, suggesting a participant number between 300 and 600 was required. According to GPower analysis, to ensure sufficient statistical power for the detection of medium sized effects in the bivariate correlational analyses performed in part two of the study, 115 participants were required (Faul, Erdfelder, Buchner, & Lang, 2009; Mayr et al., 2007). With 354 participants completing the current study, adequate statistical power was established to proceed with both EFA and correlational analyses (Cattell, 1978; Faul et al., 2009).

Measures

Copies of all measures used are presented in Appendix A.

Demographic information. Participants reported their age, gender, their university status, how long they had been a member of Facebook, an estimate of the average time they spend on Facebook per day, their total number of Facebook friends, and an estimate of the number of Facebook friends they considered to be 'actual' friends. In line with Ellison et al.'s (2011) recommendation, participants were not provided with a definition of 'actual' friends, and were therefore able to make a personal interpretation.

Facebook Intensity. The Facebook Intensity (Ellison, Steinfield, & Lampe, 2007) scale measures the extent of users' Facebook engagement beyond indices of frequency and duration. Participants rated their level of agreement to six statements on a 5-point Likert scale where 1 = *strongly disagree* and 5 = *strongly agree.* An example of a scale items is *I am proud to tell people I'm on Facebook.* Previous research has demonstrated good internal consistency, with a Cronbach's alpha of .84 (Johnston, Tanner, Lalla, & Kawalski, 2013).

Offline social connectedness. The Social Connectedness Scale-revised (Lee, et al., 2001) measured conventional social connectedness experienced from face-to-face interactions. The 20-item scale included ten reverse scored items. Participants responded to each statement on a 6- point Likert scale ranging from 1 = *strongly disagree* to 6 = *strongly agree.* An example of a positive item is *I feel close to people.* An example of a negative item is *I don't feel related to most people.* Once negative items are reversed, item scores are summed with higher scores indicating higher offline social connectedness. This scale has very high internal consistency, illustrated by a Cronbach's α of .95 (Grieve & Watkinson, 2016).

Facebook social connectedness. An adapted version of Lee et al.'s (2001) Social Connectedness Scale- Revised, developed by Grieve et al. (2013) containing 20 items assessed participants' Facebook-derived social connectedness. This scale measures how socially connected individuals feel on Facebook. Participants rated how much they agreed with positive and negative statements such as *I feel close to people on Facebook* and *I don't feel related to most people on Facebook,* on a 6-point Likert scale ranging from 1 = *strongly disagree* to 6 = *strongly agree.* Responses to negative statements are reverse scored, and all items are summed, therefore higher scores represent higher levels of social connectedness derived from

Facebook. Previous research has demonstrated excellent internal reliability, as illustrated by a Cronbach's alpha of .89 (Grieve et al., 2013).

Facebook feature social connectedness. The Social Connectedness Scale-revised (Lee et al., 2001) was modified further to to assess the experience of social connectedness when using Messenger, 'liking', commenting, wall posts, and status updates. An example of a positive item for Messenger is *I feel close to people on Facebook when I use Messenger,* while a negative example is *I feel distant from Facebook friends when I use Facebook messenger to contact them.* An example of a positive item for 'liking' is *I feel close to people when I 'like' their content on Facebook,* while a negative example is *I feel distant from Facebook friends when 'liking' their content.* An example of a positive item for commenting is *I feel close to people when commenting on their Facebook material,* while a negative example is *I feel distant from Facebook friends when I comment on their material.* An example of a positive item for wall posts is *I feel close to people on Facebook when I post on their wall,* while a negative example is *I feel distant from Facebook friends when I post on their walls.* An example of a positive item for the status feature on Facebook is *Updating my status makes me feel close to people on Facebook,* while a negative example is *I feel distant from Facebook friends when I update my status.* Participant responses ranged from 1 = *strongly disagree* to 6 = *strongly agree* on a six-point Likert scale. The ten negatively worded items were reversed before being entered into the analysis.

Subjective wellbeing. Subjective wellbeing was measured using the five-item Satisfaction with Life Scale (Diener, Emmons, Larson, & Griffin, 1985). An example of this scale is the item *I am satisfied with my life,* of which participants were asked to respond on 7-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly*

agree. This scale has high internal reliability, with a Cronbach's alpha coefficient of .85 (Bailey & Phillips, 2015).

Subjective Happiness. Participants completed the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999) as an additional measure of subjective wellbeing. An example of the four scale items is *Compared to most of my peers, I consider myself,* to which participants complete the statement based on a 7-point scale ranging from '*less happy'* to '*more happy'.* The scale demonstrates good internal consistency, with a Cronbach alpha value of .87 (Lonnqvist & grobe Deters, 2016).

Depression, anxiety, and stress. The Depression Anxiety and Stress Scales (DASS-21; Lovibond & Lovibond, 1995) were used. Participants responded to seven statements about symptoms of depression, anxiety, and stress experienced within the past week on a four-point Likert scale ranging from *0 = did not apply to me, to 5 = applied to me very much of the time.* A sample item from the depression subscale is *I couldn't seem to experience any positive feeling at all.* A sample item from the anxiety subscale is *I was aware of dryness of my mouth.* A sample item from the stress subscale is *I found it hard to wind down.* This scale has high internal reliability, demonstrating a Cronbach's alpha of .91 for depression, .91 for anxiety, and .87 for stress (Schofield, O'Halloran, McLean, Forrester-Knauss, & Paxton, 2016).

Perceived social support. Perceived social support was measured using the Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet, & Farley, 1988). The scale is comprised of 12 items in total representing social support derived from family, friends, and significant others. Subjects responded on a 7-point Likert scale ranging from 1 = *very strongly disagree* to 7 = *very strongly agree.* A sample item from the family subscale is *I can talk about my problems with my*

family. This scale demonstrates good internal consistency, as illustrated by a Cronbach alpha of .94 (McCloskey et al., 2015).

Social Anxiety. Social anxiety was measured using the Mini Social Phobia Inventory (MiniSPIN; Connor, Kobak, Churchill, Katzelnick, & Davidson, 2001). Participants were asked to respond to three statements such as *I avoid activities in which I am the center of attention.* Responses were made on a 5-point Likert scale (*0 = not at all, 4 = extremely),* based on the extent each statement applied to them. The scale has previously been demonstrated to exhibit excellent internal consistency despite its brevity, with a Cronbach's alpha figure of .80 (Grieve, Kemp, Norris, & Padgett, 2017).

Procedure

Ethics approval for the research was granted by the University of Tasmania's ethics committee (ethics approval number: H0016568; see Appendix B). Participants were recruited via notices around university, word of mouth, social media posts, announcements in first year psychology classes, and on the SONA research participation website. Participants were directed to a secure data collection platform (provided by SurveyMonkey**)** where an information sheet detailed procedural and ethical aspects of the research. Participants consented to participate by clicking 'yes'. On completion of all questionnaire items, participants were thanked for their time, and were given the opportunity to go provide their details on a separate web page were they could elect to enter the draw to win one of six $50 gift vouchers, or to receive research participation credit.

Results

Participants had a mean 592.70 (*SD* = 435.05) Facebook friends. Participants further reported a mean 124.28 (*SD* = 150.66) of these as 'actual' friends, representing 20% of participants' total friends. The proportion is similar to that seen in other research by Ellison et al. (2011), who found that 25% of participants' friends were considered 'actual' friends.

Table 1 presents the average time participants spend on Facebook each day. The greatest proportion of participants reported spending around 60 minutes per day on Facebook, indicating a level of usage that make the concept of Facebook connectedness detectable (Sinclair & Grieve, 2017). Table 2 presents the frequency that participants engage in Facebook Messenger, commenting, 'liking', wall posting, and status writing, providing further indication that Facebook feature derived connectedness had the potential to be detected. Facebook Messenger was associated with the most frequent use, with 53.7% of participants stating they used it more than 3 times per day. Status writing was used the least frequently, with 53% of participants reporting never using the status writing feature. Participants' reported level of Facebook intensity was also indicative that Facebook was being used at levels that would make correlational effects detectable.

Table 1. *Average Time Spent on Facebook Per Day*.

Time	Percentage within the sample
Up to 15 minutes	12.1
16 – 30 minutes	19.5
31 – 60 minutes	29.4
1 – 2 hours	15.0
More than 2 hours	11.6
I am logged in all day	12.4

Table 2. *Frequency of Facebook Feature Use*

	Never (*N*, %)	Occasionally (*N*, %)	Weekly (*N*, %)	Once per day (*N*, %)	A couple of times a day (*N*, %)	More than three times a day (*N*, %)
Facebook Messenger	3, 0.8	36, 10.2	34, 9.6	27, 7.6	64, 18.1	190, 53.7
Commenting	23, 6.5	172, 48.6	45, 12.7	50, 14.1	45, 12.7	19, 5.4
Liking	10, 2.8	72, 20.3	49, 13.8	53, 15.0	88, 24.9	82, 23.2
Wall Posting	87, 24.6	188, 53.1	71, 20.1	2, 0.6	4, 1.1	2, 0.6
Status Writing	188, 53	143, 40.3	15, 4.2	7, 2.0	2, 0.6	0, 0

Exploratory Factor Analysis

EFA (Maximum Likelihood with Oblique Rotation) was performed on the 140 connectedness items to test for the presence of conceptual differences between offline social connectedness, Facebook connectedness, and Facebook feature-derived social connectedness. Cases were excluded listwise where applicable (i.e., when participants did not complete survey items that related to them). The EFA assumptions of normality, linearity, independence of observations, and no issues of multicolinearity, were appropriately met (Tabachnick & Fidell, 2007). However, according to Cattell's (1978) guidelines there was an insufficient sample size for the initial EFA performed. With 140 items in the model, an 'unacceptable' KMO value of .313 was revealed, suggesting major concerns with the model, and that the data were not factorable (Howard, 2016). The 20 items pertaining to status writing were removed from the analysis, justified by an insufficient total of 167 participants completing the section, which did not meet Cattell's (1978) recommendations for adequate power.

EFA performed on the 120 items revealed a 'meritorious' KMO value of .899 (Howard, 2016). Bartlett's test of sphericity was also significant, χ^2 (7140) = 24168.71, p <.001, suggesting the presence of some relationships within the data (Howard, 2016). The decision to remove the 20 items measuring general Facebook connectedness was made on the basis that the study's major aim was to determine underlying Facebook processes facilitating social connectedness, rather than Facebook as a whole entity.

EFA performed on the remaining 100 items was deemed appropriate, meeting the outlined assumptions for EFA **(**Tabachnick & Fidell, 2007). While the final sample size (N = 267) based on the number of participants who completed all of the

measures did not meet Cattell's (1978) recommended figure, other relevant EFA statistics indicated there were no issues associated with the participant number**.** Bartlett's test of sphericity indicated the factor structure was appropriate, as illustrated by a significant chi statistic, χ^2 (4950) = 19413.77, p <.001, and testing of the KMO value (.917) further demonstrated that the data was suitable for factor analysis, and that the emerging factors should be reliable. Inspection of the correlation matrix highlighted that each item was related to a degree of .3 or above with at least one other item **(**Tabachnick & Fidell, 2007). Examination of the anti-image matrix revealed all of the diagonal correlations were between .738 and .958, providing further evidence of the study's sampling adequacy (Tabachnick & Fidell, 2007**)**. Inspection of the histograms illustrated that each of the connectedness items were relatively normally distributed. Transformation of the data was considered, however due to the robust nature of EFA to violations in normality, further analyses used the untransformed data (Tabachnick & Fidell, 2007).

Adhering to Kaiser's criterion of extracting the number of factors with an eigenvalue over one **(**Braeken & van Assen, 2017) rendered uninterpretable results, including numerous cross-loadings, and a scattered pattern matrix. Therefore Cattell's extraction criterion was used, based on the point of inflection visually represented on the scree plot. As there was no clear elbow in the scree plot, several factor solutions ranging from three to seven were attempted based on the graphical representation. Direct Oblimin (oblique) rotation was used factor model due to the anticipated degree of correlation between constructs**.** Factor loadings below .45 were suppressed to ensure a 'fair' degree (20%) of shared variance was accounted for (Tabachnick & Fidell, 2007).

A three-factor model was first attempted, explaining 40.27% of variance. Despite the emergence of three informative factors, upon inspection of other factor solutions, the three-factor model appeared too simplistic. The three-factor solution explained a relatively low percentage of variance in comparison to the other solutions examined. Furthermore, as additional factor solutions were attempted, evidence emerged suggesting that the structure of the third factor could be further broken down into distinct forms of social connectedness derived from the Facebook features. Attempting a four-factor model produced a solution that was uninterpretable, as illustrated by items failing to load to factor four, while a five-factor solution failed to converge. While the six-factor model explained a cumulative 48.62% of variance, the solution rendered uninterpretable due to a number of cross-loading items, and 30 items that failed to load.

The seven-factor model explained 50.53% of cumulative variance, converging after 19 iterations (see Table 3). There were no cross-loadings apparent at this cut-off. The selection of an oblique rotation method was supported, as illustrated by small correlations between each of the factors (see Table 4).

Table 3. *Factor Loadings based on Maximum Likelihood Analyses with Direct Oblique- Oblimin Rotation*

	Factor						
Items	1	2	3	4	5	6	7
I see myself as a loner when I 'like' content on Facebook*	.742						
I feel distant from Facebook friends when 'liking' their content*	.690						
I feel disconnected from the world of 'liking' on Facebook*	.661						
I catch myself losing a sense of connectedness with society when I post on my friend's walls on Facebook*	.659						
I feel disconnectedness from the online world around me when I use the comment function on Facebook*	.652						
I see myself as a loner when I post on friends' walls on Facebook*	.651						

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Continued

Items	Factor 1	2	3	4	5	6	7
I feel like an outsider when I use Facebook Messenger*	.638						
I see my self as a loner when I use Facebook Messenger*	.637						
I catch myself losing a sense of connectedness with society when 'liking' things on Facebook*	.627						
I see myself as a loner even when I comment on Facebook*	.626						
I feel distant from Facebook friends when I comment on their material*	.625						
I catch myself losing a sense of connectedness with society when I am commenting on Facebook*	.605						

Continued

Items	Factor 1	2	3	4	5	6	7
I feel distant from Facebook friends when I post on their walls*	.577						
I feel disconnected from the Facebook world around me when I post on people's walls*	.542						
I don't feel related to people on Facebook when I 'like' friends' content*	.510						
I feel distant from friends when I use Facebook Messenger to contact them*	.506						
I feel disconnected from the Facebook world around me when I use Messenger*	.495						
I feel like an outsider when 'liking' content on Facebook*	.492						
I catch myself losing a sense of connectedness with society when messaging friends on Facebook Messenger*	.491						

Continued

Items	Factor 1	2	3	4	5	6	7
I feel like an outsider when I post on others' walls on Facebook*	.485						
I don't feel related to people on Facebook even though I comment on their material*	.476						
I feel like an outsider when I comment on material on Facebook*	.464						
I don't feel related to most people I message on Facebook Messenger*							
'Liking' content on Facebook does not make me feel involved with anyone or any group*							
I have little sense of togetherness with my Facebook friends when I 'like' their content*							
'Liking' friends' content on Facebook makes me feel actively involved in their lives		.745					
I feel close to people when I 'like' their content on Facebook		.732					

Continued

Items	Factor						
	1	2	3	4	5	6	7
When I 'like' their content, my Facebook friends feel like my family		.643					
I am able to connect with other people on Facebook by 'liking' their content		.576					
'Liking' content on Facebook makes me feel understood by Facebook friends		.533					
I am able to related to my Facebook friends by 'liking' their content		.461					
Posting on others' walls helps me fit in during new Facebook situations							
I find myself actively involved in Facebook friends' lives when I comment on their material							
Posting on another's wall on Facebook does not help me feel that I belong*							
Posting on another's wall on Facebook does not mean I participate with anyone or any group*							
I see myself as a loner*			.795				

Continued

Items	Factor 1	2	3	4	5	6	7
I feel distant from people*			.783				
I feel close to people			.778				
I fell like an outsider*			.741				
I don't feel related to most people*			.710				
Even around people I know, I don't feel that I really belong*			.708				
I fit in well in new situations			.673				
I find myself actively involved in people's lives			.637				
I see people as friendly and approachable			.635				
I catch myself losing a sense of connectedness with society*			.627				
I am able to connect with other people			.625				
I am able to relate to my peers			.619				
I feel disconnected from the world around me*			.619				
I don't fell I participate with anyone or any group*			.594				
I feel understood by the people I know			.549				

Continued

Items	Factor						
	1	2	3	4	5	6	7
My friends feel like my family			.494				
I feel comfortable in the presence of strangers			.468				
I am in tune with the world			.468				
I have little sense of togetherness with my peers							
Even among my friends, there is no sense of brother/sisterhood*							
I feel comfortable knowing that strangers might be able to see when I comment on Facebook				-.753			
I am in tune with commenting in the Facebook world				-.664			
I feel comfortable knowing that strangers might be able to see when I 'like' something on Facebook				-.660			
I feel comfortable knowing that strangers are able to see when I post on the walls of public pages on Facebook				-.640			

Continued

Items	Factor 1	2	3	4	5	6	7
I fit in well in Facebook situations that involve commenting on new material				-.608			
I feel understood by Facebook friends when I comment on their material on Facebook							
I am in tune with the concept of 'liking' in the Facebook world							
I fit in well in Facebook situations when I 'like' new content							
I would feel comfortable messaging strangers using Facebook Messenger							
I fit in well in situations that involve messaging new people on Facebook							
I feel close to people when commenting on their Facebook material							
Even by commenting on a Facebook friends' wall, I feel no sense of brother/sisterhood*					-.588		

Continued

Items	Factor 1	2	3	4	5	6	7
Even when 'liking' content of my Facebook friends, there is no sense of brother/sisterhood*					-.537		
I don't feel that commenting helps me to participate with anyone or any group on Facebook*					-.458		
Posting on a friend's wall on Facebook does not evoke a sense of brother/sisterhood*					-.456		
Even around close friends on Facebook, I don't feel that 'liking' their content make me belong*							
Even with close Facebook friends' content, I feel like my comments do not belong*							
I have little sense of togetherness when I comment on the material of others on Facebook*							
I have little sense of togetherness with my Facebook friends when I post on their wall*							

Continued

	Factor						
Items	1	2	3	4	5	6	7
Posting on Facebook friend's walls does not make me feel more related to them*							
I am able to relate to my Facebook friends by posting on their wall						-.743	
The friends on Facebook whose walls I post on feel like my family						-.687	
I find that posting on friends' Facebook walls makes me feel actively involved in their lives						-.677	
I am able to connect with other people on Facebook by posting on their wall						-.647	
I feel understood by my Facebook friends when I post on their walls						-.624	
I feel close to people on Facebook when I post on their wall						-.619	

Continued

Items	Factor						
	1	2	3	4	5	6	7
						-.588	
I see Facebook friends whose walls I post on as friendly and approachable							
I am in tune with posting on other's walls in the Facebook world							
I am able to relate to my Facebook friends by commenting on their material							
I am able to connect with other people on Facebook by commenting on material							
I see the friends I message on Facebook as friendly and approachable							.609
I feel understood by the people I message using Facebook Messenger							.602
The Facebook friends who I contact on Messenger feel like my family							.594
I am able to relate to my Facebook friends when using Messenger							.528

Continued

Items	Factor						
	1	2	3	4	5	6	7
I feel close to people when I use Facebook Messenger							.484
I find myself actively involved in friend's lives when I message them on Facebook							
I comment on Facebook friends' material who feel like family							
I have little sense of togetherness when I use Facebook Messenger with my friends*							
I am able to connect with people by using Facebook Messenger							
I don't feel I participate with anyone or any group within Facebook Messenger*							
Even among the friends I message on Facebook, I don't feel that I really belong*							
I see Facebook friends whose material I comment on as friendly and approachable							

Even among the friends I regularly message on Facebook, there is no sense of brother/sisterhood*	
I am in tune with Facebook Messenger	
I see Facebook friends whose content I 'like' as friendly and approachable	

Note. Items marked * are reverse scored items.

Table 4. *Factor Correlation Matrix*

Factor	1	2	3	4	5	6	7
1	1.00						
2	.222	1.00					
3	.381	.128	1.00				
4	-.295	-.301	-.237	1.00			
5	-.312	.135	-.186	.030	1.000		
6	-.291	-.385	-.216	.355	.133	1.000	
7	.249	.236	.297	-.121	-.059	-.232	1.00

Factor 1 contained 22 items. Based on the range of Facebook features and nature of the items loading to factor 1, the label General Facebook feature Disconnectedness was applied. Six items loaded to factor two. The label Facebook Social Connectedness derived from Liking was given to factor two, as each item reflected feelings of inclusion obtained from Liking. Factor three contained 18 items. The label Offline Social Connectedness was given due to the loading items reflecting feelings of inclusion obtained from face-to-face interactions, as consistent with previous research (Grieve et al., 2013; Sinclair & Grieve, 2017). Factor four contained five items, given the label Facebook Social Ease due to the nature of the items reflecting perceived comfort in the Facebook domain. Factor five contained four items. The label Active Facebook disconnectedness was given, with the loading items representing perceived disconnection when actively engaging in Facebook activities. Factor six was labeled Facebook Social Connectedness derived from wall posts, containing items reflecting perceived social connectedness derived from wall posting. Similarly, factor seven contained items that reflected perceived social connectedness derived from Facebook Messenger. Based on the nature of the items, the label Facebook Social Connectedness derived from Facebook Messenger was given.

According to the guidelines for factor analysis, all seven factors had substantial loadings that were distinct and interpretable (Howard, 2016). However, the entirely reversed nature of items loading to General Facebook feature Disconnectedness and Active Facebook disconnectedness was suggestive of systematic measurement error (Urban, Szigeti, & Kokonei, 2014). Based on the recommendation of previous research by Sinclair and Grieve (2017), and given that the current investigation was aimed at determining the mechanisms related to

Facebook social *connectedness,* factors one and five were not considered in the successive analyses due to their reflection of disconnectedness.

Descriptive Statistics and Bivariate Correlations

Subscales were created based on the factors of interest that emerged from the EFA. The scales were; Facebook Social Connectedness for Liking, Offline Social Connectedness, Social Ease on Facebook, Facebook Social Connectedness for Wall Posting, and Facebook Social Connectedness for Messenger. Descriptive statistics and internal consistency (measured via Cronbach's alpha) for each of these measures are presented in Table 5. Each scale demonstrated good-to-excellent internal consistency, and the reliability of Offline Social Connectedness closely replicated previous findings (Grieve et al., 2013; Lee et al., 2001). Table 6 presents descriptive statistics for stress, depression, anxiety, social anxiety, subjective wellbeing, subjective happiness, and perceived social support.

Table 5. *Descriptive Statistics and Psychometric Properties of the Studied Variables*

Factor	Mean	Standard deviation	Cronbach's Alpha
Facebook Social Connectedness for Liking (6 items)	27.16	6.04	.842
Offline Social Connectedness (18 items)	78.10	15.00	.928
Social Ease on Facebook (5 items)	17.44	6.26	.839
Facebook Social Connectedness for Wall Posting (7 items)	28.65	6.60	.899
Facebook Social Connectedness for Messenger (5 items)	20.69	4.63	.809

Table 6. *Mean ratings of Participants' Facebook Use and Measures of Psychological Wellbeing*

Measure	Mean	Standard deviation
Facebook intensity	20.28	5.39
Subjective Wellbeing	23.62	6.05
Subjective Happiness	18.53	5.68
Stress	6.54	4.45
Depression	4.63	4.56
Anxiety	3.90	4.23
Social anxiety	8.29	2.94
Perceived social support	67.48	14.17

Bivariate correlations are presented in Table 7, with subsequent interpretations made according to Cohen's (1992) effect size guidelines. Offline social connectedness was significantly related to social connectedness derived from liking, wall posts, and Messenger, as illustrated by effect sizes ranging from medium to large. Offline social connectedness was significantly correlated to each of the psychological wellbeing measures in the predicted direction, displaying medium to large effect sizes.

Messenger-derived connectedness demonstrated a small-to-medium negative relationship with stress, anxiety, and depression, and a moderate positive relationship with subjective wellbeing, perceived social support, and subjective happiness- all of which were statistically significant. Messenger-derived social connectedness was not significantly related to social anxiety. Wall Post-derived connectedness shared a small positive relationship with perceived social support and subjective happiness, both of which were statistically significant. Wall post-derived connectedness was not significantly related to stress, anxiety, depression, social anxiety, positively associated with subjective wellbeing, or subjective happiness. Liking-derived connectedness shared a small but statistically significant negative relationship with stress, anxiety, and depression. Small but significant positive relationships between liking-derived connectedness and subjective wellbeing, subjective happiness, and perceived social support were present. Liking-derived social connectedness was trivially and non-significantly related to social anxiety.

Social Ease on Facebook was negatively related to stress, depression, anxiety, and social anxiety to a small but significant degree. Social ease on Facebook shared a small but statistically significant positive relationship with subjective happiness, and

a trivial non-significant positive relationship with subjective wellbeing and perceived social support.

Lastly, participants' actual' number of Facebook friends was positively and significantly related to liking-derived connectedness, wall posting-derived connectedness, and offline social connectedness. Participants' total number of Facebook friends was positively and significantly related to wall posting-derived connectedness, and offline social connectedness, representing a stronger relationship with wall posting-derived connectedness than participants' 'actual' number of friends. Additionally, participants' number of 'actual' Facebook friends shared a small but significant positive relationship with subjective wellbeing and happiness, and a small but significant negative relationship with measures of depression, anxiety, and social anxiety. Participants' total number of Facebook friends did not share significant relationships with any of the psychological measures. Additionally, participants' '

Table 7. *Bivariate Correlations*

Measures	1	2	3	4	5	6	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. LikeSc	-														
2. Sc	.324**	-													
3. SE	.441**	.316**	-												
4. WallSc	.627**	.344**	.422**	-											
5. MessSc	.518**	.404**	.279**	.485**	-										
6. FBI	.444**	.194**	.326**	.333**	.241**	-									
7. SWL	.189**	.481**	.087	.109	.205**	.121*	-								
8. SH	.211**	.511**	.142**	.168**	.240**	.114*	.642**	-							
9. PSS	.232**	.502**	-.102	.187**	.290**	.122*	.463**	.425**	-						
10. Stress	-.126*	-.392**	-.167**	-.067	-.145**	.009	-.347**	-.489**	-.215**	-					

Measures	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
11. Anxiety.	-.108*	-.385**	-.152**	-.110	-.173**	.017	-.326**	.415**	-.203**	.720**	-				
12. Depression	-.167**	-.467**	-.107*	-.089	-.188**	-.028	-.554**	-.607**	-.358**	.682**	.629**	-			
13. SA	-.026	-.437**	-.194**	-.004	-.072	-.129*	-.344**	-.397**	-.186**	.389**	.474**	.402**	-		
14. Total Friends	.066	.176**	.093	.170**	.010	.160**	-.017	.060	.036	.084	.002	.048	-.098	-	
15. Actual Friends	.153**	.195**	.104	.134*	.014	.191**	.112*	.141*	. 079	-.083	-.114*	-.114	-.121*	.373**	-

Note. Factor loadings < .45 are suppressed. LikeSc = Liking-derived Social Connectedness. Sc = Offline Social connectedness. SE = Social Ease. PostSc = Wall Post-derived Social Connectedness. MessSc = Messenger-derived Social Connectedness. FBI = Facebook Intensity. SWL = Satisfaction With Life. SH = Subjective Happiness. PSS = Perceived Social Support. SA = Social Anxiety. * p <. 05. ** p < .01.

Discussion

The first aim of the current investigation was to identify whether the features of Facebook promote forms of social connectedness that are conceptually discrete from one another. The hypothesis that feature derived social connectedness were separable was supported, with an EFA demonstrating a seven-factor solution. Liking-derived connectedness, wall posting-derived connectedness, Messenger-derived connectedness, and offline social connectedness emerged as conceptually discrete, yet moderately related constructs. Items reflecting social connectedness derived from commenting on Facebook did not emerge as a unique construct, while the inclusion of items reflecting status writing connectedness and general Facebook connectedness rendered uninterpretable factor solutions. Furthermore, unforeseen evidence for three additional concepts pertaining to Facebook use emerged. Substantial factor loadings were evident for social ease on Facebook. Factors reflecting general Facebook feature disconnectedness, and active disconnectedness on Facebook emerged that were comprised solely of reversed items. Due to suspected measurement error (Sinclair & Grieve, 2017; Urban et al., 2014), and diversion from the primary objectives of the study, both factors were not interpreted further.

The second aim of the study was to investigate how the emerging factors related to several measures of psychological wellbeing. Bivariate correlational analyses supported the hypothesis that forms of Facebook connectedness would be associated with low depression, anxiety, stress, and social anxiety, and elevated subjective wellbeing, subjective happiness, and perceived social support. Specifically, the prediction that Messenger-derived connectedness would be most

strongly associated with these outcomes relative to the other forms of feature derived social connectedness was supported.

Facebook Connectedness: The Influence of Feature Type

The EFA revealed that the different forms of communication characterised by each feature are associated with distinct forms of social connectedness. The moderate relationship between social connectedness derived from Facebook Messenger, liking, wall posts, and offline social connectedness highlights there is a degree of commonality linking the concepts (Challands et al., 2017; Howard, 2016).

The emergence of a factor encompassing feelings of social connectedness derived from Facebook Messenger supported the hypothesis. Facebook Messenger allows directed, private, inbound communication (Antheunis et al., 2015). These characteristics help explain the strong relationship exhibited between Messenger-derived connectedness, and offline social connectedness and psychosocial wellbeing. Engaging in targeted one-on-one communication with strong social ties promotes social interaction rich in emotion and reciprocity (Burke & Kraut, 2016; Sheer & Rice, 2017**)**. Additionally, Facebook Messenger is characterised by a greater degree of social investment, effort, and written composition when compared to 'liking', commenting, and wall posting (Burke & Kraut, 2016; Chen, Wang, Wegner, Gong, Fang, & Kaljee, 2015). Therefore, consistent with research by Burke et al. (2010) and Lee et al.'s (2014) finding that directed communication was strongly associated with bonding social capital, the results of the current EFA suggest that Facebook Messenger is a strong source of bonding social capital (and thus social connectedness).

Similarly, the evidence for liking-derived social connectedness supported predictions. The emergence of the construct representing liking-derived

connectedness is consistent with Lee et al.'s (2014) finding that Facebook 'liking' was significantly and positively associated with bonding social capital. The finding contributes to recent research highlighting the social advantages associated with PDAs (e.g., Eranti & Lonkila, 2015; Hayes et al., 2016; Rodriguez-Hidalogo et al., 2017; Wohn et al., 2016). PDAs (such as 'liking' on Facebook) enable users to display their care and support for others in a low-effort manner. The current EFA provides evidence to support this notion, challenging the previous perception that social interaction is more beneficial when it involves more effort and elaboration (Burke & Kraut, 2016). Liking-derived connectedness therefore appears to reflect the largely under-acknowledged importance of the Facebook 'like' in facilitating feelings of belonging and psychological wellbeing.

The EFA revealed wall posting-derived connectedness emerging strongly as a unique construct, supporting the research hypotheses. Lee et al. (2014) found that using the 'wall' feature with greater frequency was significantly related to bridging social capital. The failure of a factor reflecting commenting-derived connectedness to emerge is somewhat consistent with Lee et al.'s (2014) research suggesting commenting on Facebook shared a significant negative relationship with bonding social capital. A potential explanation for the finding is that wall posting involves a greater degree of social investment (Chen et al., 2015), and level of written composition (Burke & Kraut, 2016) when compared to commenting. The greater degree of investment involved with wall posting thus facilitates greater feelings of social connectedness. These findings affirm the interpretation that 'liking' acts as a PDA on Facebook, as despite involving comparatively lower effort, social connectedness derived from 'liking' emerged as a strong separable factor, whereas

commenting did not. Overall, findings of the EFA indicate that there are different social resources embedded in different Facebook features (Sheer & Rice, 2017).

The current findings demonstrate that Facebook contains easily accessible features that can be used to attain 'low risk' forms of social capital (McEwan, 2013). While previous research has focused on investigating Facebook as a whole entity, the emergence of distinct factors representing Facebook feature-derived connectedness illustrates processes in which Facebook can be used to facilitate social interaction **(**Sheer & Rice, 2017). The current findings therefore provide preliminary evidence regarding the features that enable users' belongingness needs to be met on the social media platform (Baumeister & Leary, 1995).

The presence of factors reflecting general and active disconnectedness derived from Facebook features suggest an inherent complexity of Facebook social connectedness. Consistent with previous research (e.g. Sinclair & Grieve, 2017), the finding that two oblique factors representing social disconnectedness were comprised of entirely negatively worded items has two possible interpretations. The first explanation is that both factors represent negative method factor effects, whereby the error in measurement explains the depicted variance (Urban et al., 2014). In the case of the current study, the emergence of general Facebook feature disconnectedness and active disconnectedness may be an artifact of the wording of the negative items, as opposed to underlying conceptual differences (Urban et al., 2014). Method factor effects appear to be the most plausible explanation for the findings, as illustrated by the correct cross- loading of negatively worded items in the original offline social connectedness scale (Grieve et al., 2013; Sinclair & Grieve, 2017). The second explanation is that the emergence of disconnectedness

factors is accurate, and represents a distinguishable construct to feelings of *connectedness* on Facebook (Sinclair & Grieve, 2017).

Forms of Facebook Connectedness and Wellbeing

Examining the relationships between social connectedness derived from Facebook features and psychological wellbeing largely supported the hypotheses. Both liking-derived connectedness, and Messenger-derived connectedness shared significant small negative correlations with stress, depression, anxiety, and social anxiety, and significant positive associations with life satisfaction, subjective happiness, and perceived social support of magnitudes between small and medium. Wall posting-derived connectedness shared small but significant positive associations with subjective happiness and perceived social support.

The correlational findings substantiate existing evidence that social connectedness acquired through Facebook is associated with beneficial psychological outcomes similar to those derived from face-to-face interactions (Grieve et al., 2013; Challands, et al., 2017). Specifically, the findings are consistent with previous research illustrating the relationship between higher levels of Facebook connectedness and lower rates of anxiety and depression, and enhanced life satisfaction (Grieve et al., 2013); positive psychological wellbeing among American college students (Hu et al., 2017); general online social connectedness and reduced anxiety and depression in rural settings (Townsend et al., 2016); and a sense of social connectedness derived from participation on Twitter (Riedl et al., 2013; Lin et al., 2016).

Importantly, the relationships seen in the current data also align with principles embedded in belongingness theory. Belongingness theory says that when an individual's belongingness needs are satisfied through feelings of connection with

others, their optimal level of functioning is promoted (Baumeister & Leary, 1995; Lee & Robbins, 1998). Therefore, the finding that Facebook social connectedness was associated with negatively related to low levels of poor psychological wellbeing (e.g. depression and anxiety), and positively related to measures of psychological wellbeing (e.g. life satisfaction and subjective happiness), suggests that a sense of connectedness online is related to one's optimum psychological functioning.

It is important to emphasise that the current research makes no attempt to infer that the identified factors directly *cause* the levels of psychological wellbeing depicted. Again, a more elaborative interpretation is also possible. For example, individuals with pre-existing profiles of psychological wellbeing might be drawn to SNSs such as Facebook. This would align with the social enhancement hypothesis of Internet use, whereby some individuals use the Internet to reinforce their already strong offline relationships (Zywica & Danowski, 2008). Alternatively, individuals experiencing symptoms of depression, and anxiety might be likely to disengage from social interactions in offline and online domains. The current discussion therefore focuses on drawing relational conclusions only.

Additional Findings: Feeling Socially at Ease on Facebook

Strong evidence for a concept reflecting feelings of social ease and comfort on Facebook was revealed in the factor from the EFA. Social ease on Facebook shared its strongest negative association with social anxiety. Social anxiety describes the experience of discomfort in social situations, mainly due to fears of negative appraisal from others (Lundy & Drouin, 2016). The social compensation hypothesis suggests that people who are socially uncomfortable offline prefer interacting online (Grieve et al., 2017; Nadkarni & Hofmann, 2012). For socially anxious people, Facebook appears to provide a social platform of comfort, social support (Indian &

Grieve, 2014) and social capital. Given the moderate negative relationship between Facebook social ease and social anxiety, and within the context of the social compensation hypothesis, the conceptual label given to the factor appears valid. The construct also shared meaningful associations with subjective happiness, stress, anxiety, and depression, providing further evidence for this interpretation of Facebook social ease.

The finding that social ease on Facebook is moderately associated with social connectedness derived from Facebook Messenger and wall posting, and strongly associated with liking-derived connectedness, suggests that feeling comfortable on Facebook may promote the use of Facebook features. Interestingly, but not surprisingly, the strong association shared between liking-derived connectedness and social ease is suggestive of the role of 'liking' (as a potential PDA) as a simple, easy and 'low risk' process that individuals feel comfortable using in order to feel connected (Hayes et al., 2016; Lundy & Drouin, 2016; Wohn et al., 2016).

Quantity versus Quality of Facebook Friends: exploring the concept of Actual friends on Facebook

Correlational analysis revealed that participants' 'actual' number of Facebook friends shared modest but significant correlations with measures of psychological wellbeing. None of the examined measures were significantly related to participants' *total* number of Facebook friends.

These findings suggest that classifying Facebook friends under the one banner term 'friends' is uninformative. Evidence is presented to suggest one's 'actual' number of Facebook friends is generally more informative (Ellison et al., 2011; Khan & Ellison, 2014), despite a large proportion of literature failing to distinguish between Facebook friends of varying closeness. Given that social

connectedness is a form of bonding social capital (i.e., close ties characterised by emotion and intimacy), focusing on subjects' 'actual' friend number is more prudent. These findings are also in line with the conceptualisation of social connectedness being made not only in terms of quantity, but also in terms of relationship *quality* (Baumeister & Leary, 1995; Lee et al., 2001). While having a large number of Facebook friends increases the opportunity to interact with others via Facebook features (Greitemeyer, Mugge, & Bollermann, 2014), it is individuals' interactions with *actual* friends that are associated with more positive psychological outcomes.

Limitations and Directions for Future Research

The cross sectional design used in the current study means that causality cannot be inferred, and as noted, there are multiple explanations for the depicted wellbeing relationships. Future research could implement a longitudinal design to provide more insight into the directionality of the relationships seen in the current study. Longitudinal research would also help to unpack the findings further, by examining whether forms of Facebook social connectedness are associated with more enduring psychological wellbeing **(**Sheer & Rice, 2017). Nonetheless, although causal relationships could not be confirmed in the current study, it is worthwhile noting that according to belongingness theory (and based on previous longitudinal research), psychosocial wellbeing emerges as a consequence of belongingness needs being met (Baumeister & Leary, 1995).

The survey methodology entails that the data is reliant upon self-reported responses. The issues associated with self-reporting include social desirability effects (Brajsa-Zganec, Ivanovic, & Lipovcan, 2011**)**, and the potential of common method variance to inflate the relationships seen between constructs (Williams & McGonagle, 2016). Given that participation was online and anonymous however, it

is unlikely that socially desirable responding systematically influenced the data. Rather, self-reporting in the current study provided a valuable source of personal insight beyond the capacity of external sources of information (Challands et al., 2017; Indian & Grieve, 2014). Caution is still required however, and future research may enhance self-reported information with objective behavioural measures, such as content analysis of users' wall posts and messages (Grieve et al., 2013).

The quality of EFA output is dependent on the data entered into the analysis by researchers (Howard, 2016). Based on extant research, the current study focused on participants' outbound use of Facebook Messenger, liking, commenting, and creating wall posts. However, there are many other processes in which social connectedness may be derived on Facebook that were not measured in the current study. Research by Zell and Moeller (2018) found that *receiving* more 'likes' and comments on subjects' Facebook statuses was related to higher levels of reported happiness and self-esteem. Future research may therefore consider investigating broader aspects of Facebook use associated with social connectedness, including passively viewing Facebook content, and receiving messages, 'likes', comments, and wall posts.

Despite being the most used SNS worldwide (Facebook Newsroom, 2017), future research should investigate social connectedness processes in other social media platforms such as Snapchat, and Instagram. Examining social connectedness facilitated via these SNSs would assist in conceptualising the current findings regarding Facebook connectedness within the broader framework of belonging online.

Implications

The current study has both theoretical and practical implications. Firstly, the research findings have contributed to the theoretical understanding of social connectedness within the broader framework of belongingness. This was the first study to examine the specific features that are related to Facebook social connectedness. Broadly, the presence of factors pertaining to different forms of Facebook social connectedness provide further support that the concept of social connectedness translates to the Facebook domain (Grieve et al., 2013; Sinclair & Grieve, 2017). The emergence of liking-derived connectedness, Messenger-derived connectedness, and wall posting-derived social connectedness advance our understanding of how Facebook users obtain feelings of social connectedness on the platform. Importantly, the current research established preliminary evidence regarding the features that enable users to fulfill their belongingness needs on the social media platform (Baumeister & Leary, 1995).

Investigating the specific Facebook features that allow social connectedness to be derived also represents a key step forward in the conceptualisation of social connectedness in online environments. Where previous research has predominately focused on Facebook as a whole entity, the current investigation highlights the importance of looking beyond Facebook as the merely the 'sum of its parts' (Neves, 2015). The current findings provide further evidence that Facebook features differ on a number of axes, including their facilitation of bonding (versus bridging) social capital (Burke & Kraut, 2016; Kraut & Burke, 2015.). Contrarily to earlier *displacement* views of SNSs suggesting that feeling increasingly socially connected online replaces feelings of social connectedness offline (Neves, 2015), the current research provides evidence that social connectedness derived from Facebook

features supplements belongingness needs satisfied through face-to-face interactions (Challands, et al., 2017).

A critical finding is that social connectedness derived from 'liking', Messenger, and to a lesser extent wall posting, were linked with measures of psychological wellbeing. Examining these relationships provided insight into the specific mechanisms in which Facebook connectedness is related to psychological health. It is evident that Facebook use has broader implications for users beyond the immediate provision of social connectedness, information, and leisure (Kraut & Burke, 2015). The findings therefore reiterate online social connectedness as a means to meet belongingness needs (Challands et al., 2017).

From a broader societal perspective, the current findings support a growing body of literature demonstrating SNS use links with positive wellbeing **(**Hu et al., 2017**).** Appreciating the heterogeneous nature of online social interaction is therefore important. The depicted associations challenge 'black and white' trope of SNSs contributing to blanket positive or negative psychological outcomes. Like face-to-face social interaction, the current research suggests that Facebook use is associated with both positive and negative psychological outcomes (Hu et al., 2017), and these outcomes depend how users engage with features embedded in SNSs (Kraut & Burke, 2015).

A substantial number of individuals seek therapy for psychological problems associated with loneliness and social isolation (Cho, 2014). Social capital can act as a buffer against depressive and anxiety symptoms (Pendry & Salvatore, 2015; Riedl, Kobler, Goswami, & Krcmar, 2013). Understanding the potential sources of social capital (e.g. social connectedness) is therefore crucial. The current findings present preliminary evidence that Facebook connectedness may act as a protective factor

against some of the outcomes of poor social connectedness (Challands, et al., 2017; Lee & Robbins, 1998). While additional research is needed, it is possible that social connectedness derived online may help to attenuate the experience of depression and anxiety.

Conclusion

In conclusion, the current study builds logically upon prior research finding that Facebook connectedness is a distinguishable construct that is related to psychological wellbeing (Grieve et al., 2013**)**. The current study is the first known to investigate the specific processes that facilitate social connectedness on Facebook. Evidence is presented suggesting that social connectedness derived from Facebook Messenger, 'liking', and wall posting represent unique constructs that are conceptually related. Importantly, feature-derived connectedness is related to measures of psychological wellbeing to varying degrees. Irrespective of the cross-sectional design, the illustrated associations inform the existing framework of belongingness, and have potential applications in practical and clinical settings worth exploring through future research. The advent of social media alone has bought considerable changes to many social norms (Kraut & Burke, 2015). This research highlights the importance of ensuring understanding of concepts embedded in belongingness theory remain up-to-date.

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Appendices

Appendix A1

Demographic Information.

Please answer the following questions as they apply to you:

Age:

Gender: male/female/other

Are you a university student? yes/no

How long have you been a Facebook user? _____

How many **TOTAL** friends do you have on Facebook? _____

Of those, how many would you say are *actual* friends offline? _____

In the past week, on average, approximately how much time **PER DAY** have you spent actively using Facebook? _____

Appendix A2

Offline Social Connectedness Scale-Revised (Lee, Draper, & Lee, 2001).

Directions: "The following statements reflect various ways in which we view ourselves. Rate the degree to which you agree or disagree with each statement."

(Responses are given on a 6 point Likert scale, where 1 = *Strongly Disagree* and 6 = *Strongly Agree*).

1. I feel comfortable in the presence of strangers.
2. I am in tune with the world.
3. Even among my friends, there is no sense of brother/sisterhood.*
4. I fit in well in new situations.
5. I feel close to people.
6. I feel disconnected from the world around me.*
7. Even around people I know, I don't feel that I really belong.*
8. I see people as friendly and approachable.
9. I feel like an outsider.*
10. I feel understood by the people I know.
11. I feel distant from people.*
12. I am able to relate to my peers.
13. I have little sense of togetherness with my peers.*
14. I find myself actively involved in people's lives.
15. I catch myself losing a sense of connectedness with society.*
16. I am able to connect with other people.
17. I see myself as a loner.*

18. I don’t feel related to most people.*

19. My friends feel like my family.

20. I don’t feel I participate with anyone or any group.*

Note. Items marked * are reversed scored. Total scores are derived by summing each scale item. Higher scores indicate a greater sense of social connectedness derived from face-to-face interactions.

Appendix A3

The Facebook social connectedness scale: (Grieve, Indian, Witteveen, Tolan, & Marrington, 2013).

Directions: "Rate the extent to which you agree or disagree with each statement." (Responses are given on a 6 point Likert scale, where 1 = *Strongly Disagree* and 6 = *Strongly Agree*).

1. I feel comfortable in the presence of strangers when I'm on Facebook.
2. I am in tune with the Facebook world.
3. Even among my Facebook friends, there is no sense of brother/sisterhood.*
4. I fit in well in new Facebook situations.
5. I feel close to people on Facebook.
6. I feel disconnected from the Facebook world around me.*
7. Even around Facebook friends I know, I don't feel that I really belong.*
8. I see Facebook friends as friendly and approachable.
9. I feel like an outsider when I'm on Facebook.*
10. I feel understood by the people I know when I'm on Facebook.
11. I feel distant from Facebook friends.*
12. I am able to relate to my Facebook friends.
13. I have little sense of togetherness with my Facebook friends.*
14. I find myself actively involved in Facebook friend's lives.
15. I catch myself losing a sense of connectedness with society when I am on Facebook.*
16. I am able to connect with other people on Facebook.

17. I see myself as a loner when I am on Facebook.*
18. I don't feel related to most people on Facebook.*
19. My Facebook friends feel like my family.
20. I don't feel I participate with anyone or any group on Facebook.*

Note. Items marked * are reversed scored. Total scores are derived by summing each scale item. Higher scores indicate a greater sense of social connectedness derived from Facebook.

Appendix A4

The Facebook social connectedness scale for Messenger- adapted from Grieve et al., (2013) and Lee, Draper, and Lee (2001).

Directions: "Rate the extent to which you agree or disagree with each statement. (Responses are given on a 6 point Likert scale, where 1 = *Strongly Disagree* and 6 = *Strongly Agree*).

1. I would feel comfortable messaging strangers on Facebook Messenger.
2. I am in tune with the Messenger world of Facebook.
3. Even among the friends I regularly message on Facebook, there is no sense of brother/sisterhood.*
4. I fit in well in new situations that involve messaging people on Facebook.
5. I feel close to people when I use Facebook Messenger.
6. I feel disconnected from the Facebook world around me when I use Messenger.*
7. Even among the friends I message on Facebook, I don't feel that I really belong.*
8. I see the friends I message on Facebook as friendly and approachable.
9. I feel like an outsider when I use Facebook Messenger.*
10. I feel understood by the people I message on Facebook Messenger.
11. I feel distant from friends when I use Facebook Messenger to contact them.*
12. I am able to relate to my Facebook friends when using Messenger.
13. I have little sense of togetherness when I use Facebook Messenger with my friends.*
14. I feel actively involved in friend's lives when I message them on Facebook.

15. I catch myself losing sense of connectedness with society when messaging friends on Facebook Messenger.*
16. I am able to connect with people by using Facebook Messenger.
17. I see myself as a loner when I use Facebook Messenger.*
18. I don’t feel related to most people I message on Facebook Messenger.*
19. The Facebook friends who I contact on Messenger feel like my family.
20. I don’t feel I participate with anyone or any group within Facebook Messenger.*

Note. Items marked * are reversed scored. Total scores are derived by summing each scale item. Higher scores indicate a greater sense of social connectedness derived from messaging others on Facebook Messenger.

Appendix A5

The Facebook social connectedness scale for commenting- adapted from Grieve et al., (2013) and Lee, Draper, and Lee (2001).

Directions: "Rate the extent to which you agree or disagree with each statement." (Responses are given on a 6 point Likert scale, where 1 = *Strongly Disagree* and 6 = *Strongly Agree*).

1. I feel comfortable knowing that strangers might be able to see when I comment on Facebook material.
2. I am in tune with commenting in the Facebook world.
3. Even by commenting on a Facebook friends' wall, I feel no sense of brother/sisterhood.*
4. I fit in well in new Facebook situations that involved commenting.
5. I feel close to people when commenting on their Facebook material.
6. I feel disconnected from the online world around me when I use the comment function on Facebook.*
7. Even with close Facebook friends' content, I feel like my comments do not belong*
8. I see Facebook friends as friendly and approachable, making me feel comfortable to comment on their material.
9. I feel like an outsider when I comment on material on Facebook.*
10. I feel understood by Facebook friends when I comment on their material on Facebook.
11. I feel distant from Facebook friends when I comment on their material.*
12. I am able to relate to my Facebook friends by commenting on their material.

13. I have little sense of togetherness when I comment on the material of others on Facebook.*
14. I feel actively involved in Facebook friend's lives when I comment on their material.
15. I catch myself losing a sense of connectedness with society when I am commenting on Facebook.*
16. I am able to connect with other people on Facebook by commenting on material.
17. I see myself as a loner even when I comment on Facebook.*
18. I don't feel related to people on Facebook even though I comment on their material.*
19. I comment on Facebook friends' material who feel like family.
20. I don't feel that commenting helps me to participate with anyone or any group on Facebook.*

Note. Items marked * are reversed scored. Total scores are derived by summing each scale item. Higher scores indicate a greater sense of social connectedness derived from commenting on Facebook.

Appendix A6

The Facebook social connectedness scale for 'liking'- adapted from Grieve et al., (2013) and Lee, Draper, and Lee (2001).

Directions: "Rate the extent to which you agree or disagree with each statement." (responses are given on a 6 point Likert scale, where 1 = *Strongly Disagree* and 6 = *Strongly Agree*).

1. I feel comfortable knowing that strangers might be able to see when I 'like' something on Facebook.
2. I am in tune with the concept of 'liking' in the Facebook world.
3. Even when 'liking' content of my Facebook friends, there is no sense of brother/sisterhood.*
4. I fit in well when I 'like' content in new Facebook situations.
5. I feel close to people when I 'like' their content on Facebook.
6. I feel disconnected from the world of 'liking' on Facebook.*
7. Even around close friends on Facebook, I don't feel that 'liking' their content make me belong.*
8. I see Facebook friends as friendly and approachable in terms of being able to 'like' their content.
9. I feel like an outsider when 'liking' content on Facebook.*
10. 'Liking' content on makes me feel understood by Facebook friends.
11. I feel distant from Facebook friends when 'liking' their content.*
12. I am able to relate to my Facebook friends by 'liking' their content.

13. I have little sense of togetherness with my Facebook friends when I ‘like’ their content.*
14. ‘Liking’ friends’ content on Facebook makes me feel actively involved in their lives.
15. I catch myself losing a sense of connectedness with society when ‘liking’ things on Facebook.*
16. I am able to connect with other people on Facebook by ‘liking’ their content.
17. I see myself as a loner when I ‘like’ content on Facebook.*
18. I don’t feel related to people on Facebook when I ‘like’ friends’ content.*
19. When I ‘like’ their content, my Facebook friends feel like my family.
20. ‘Liking’ content on Facebook does not make me feel involved with anyone or any group.*

Note. Items marked * are reversed scored. Total scores are derived by summing each scale item. Higher scores indicate a greater sense of social connectedness derived from ‘liking’ on Facebook.

Appendix A7

The Facebook social connectedness scale for wall posts- adapted from Grieve et al., (2013) and Lee, Draper, and Lee (2001).

Directions: "Rate the extent to which you agree or disagree with each statement." (Responses are given on a 6 point Likert scale, where 1 = *Strongly Disagree* and 6 = *Strongly Agree*).

1. I feel comfortable knowing that strangers are able to see when I post on the walls of public pages on Facebook.
2. I am in tune with posting on other's walls in the Facebook world.
3. Posting on a friend's wall on Facebook does not evoke a sense of brother/sisterhood.*
4. Posting on others' walls helps me fit in during new Facebook situations.
5. I feel close to people on Facebook when I post on their wall.
6. I feel disconnected from the Facebook world around me when I post on people's walls.*
7. Posting on another's wall on Facebook does not help me feel that I belong.*
8. When I post on others' walls, I see my Facebook friends as friendly and approachable.
9. I feel like an outsider when I post on others' walls on Facebook.*
10. I feel understood by my Facebook friends when I post on their walls.
11. I feel distant from Facebook friends when I post on their walls.*
12. I am able to relate to my Facebook friends by posting on their wall.
13. I have little sense of togetherness with my Facebook friends when I post on their wall.*
14. I find that posting on friends' Facebook walls makes me feel actively involved in their lives.

15. I catch myself losing a sense of connectedness with society when I post on my friend's walls on Facebook.*
16. I am able to connect with other people on Facebook by posting on their wall.
17. I see myself as a loner when I post on friends' walls on Facebook.*
18. Posting on Facebook friend's walls does not make me feel more related to them.*
19. The friends on Facebook whose walls I post on feel like my family.
20. Posting on friends' walls on Facebook does not make me belong with anyone or any group.*

Note. Items marked * are reversed scored. Total scores are derived by summing each scale item. Higher scores indicate a greater sense of social connectedness derived from creating wall posts.

Appendix A8

The Facebook social connectedness scale for status updates- adapted from Grieve et al., (2013) and Lee, Draper, and Lee (2001)

Directions: "Rate the extent to which you agree or disagree with each statement." (Responses are given on a 6 point Likert scale, where 1 = *Strongly Disagree* and 6 = *Strongly Agree*).

1. I feel comfortable making Facebook status updates knowing that strangers might be able to see.
2. I am in tune with making status updates in the Facebook world.
3. Updating my status does not evoke a sense of brother/sisterhood on Facebook.*
4. I fit in well in new situations by updating my Facebook status.
5. Updating my status makes me feel close to people on Facebook.
6. I feel disconnected from the Facebook world around me when I update my status.*
7. Updating my Facebook status does not make me feel that I belong.*
8. When I update my status, I see my Facebook friends as friendly and approachable.
9. I feel like an outsider when I update my status on Facebook.*
10. I feel understood by my Facebook friends when I update my status.
11. I feel distant from Facebook friends when I update my status.*
12. I am able to relate to my Facebook friends by updating my status.
13. I have little sense of togetherness with my Facebook friends when I update my status.*
14. I find that updating my Facebook status makes me actively involved in their lives.
15. I catch myself losing a sense of connectedness with society when I update my Facebook status.*

16. I am able to connect with other people by updating my Facebook status.
17. When I update my Facebook status, I feel like a loner.*
18. Updating my Facebook status does not make me feel related to my friends.*
19. My Facebook friends feel like my family when I update my status.
20. Updating my Facebook status does not mean that I participate with anyone or any group.*

Note. Items marked * are reversed scored. Total scores are derived by summing each scale item. Higher scores indicate a greater sense of social connectedness derived from status updates.

Appendix A9

Facebook Intensity Scale (Ellison, Steinfield, & Lampe, 2007).

Directions: "Please indicate the extent to which you agree or disagree with the following:" (Responses are given on a five point Likert scale where 1 = *strongly disagree* and 5 = *strongly agree*).

1. Facebook is part of my everyday activity
2. I am proud to tell people I'm on Facebook
3. Facebook has become part of my daily routine
4. I feel out of touch when I haven't logged onto Facebook for a while
5. I feel I am part of the Facebook community
6. I would be sorry if Facebook shut down

Note. Total scores are derived by summing each item. Higher scores indicate greater levels of Facebook Intensity.

Appendix A10

Subjective Happiness Scale (Lyubomirsky & Lepper, 1999).

Participants respond to the following questions using 7 point Likert scales, with anchors as indicated for each item.

1. In general, I consider myself: 1 = *not a very happy person*; 7 = *a very happy person*.
2. Compared to most of my peers, I consider myself: 1 = *less happy*; 7 = *more happy*.
3. Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extent does this characterisation describe you? 1 = *not at all*; 7 = *a great deal.*
4. Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. To what extend does this characterisation describe you?* 1 = *not at all*; 7 = *a great deal.*

Note. Items marked * are reversed scored. Total scores are derived by summing each item. Higher scores indicate greater levels of subjective happiness.

Appendix A11

MiniSPIN (Connor, Kobak, Churchill, Katzelnick, & Davidson, 2001).

Directions: Please rate the extent to which the following statements apply to you. (Participants respond to the following questions using a 5-point Likert scale: 0 = *not at all*, 1 = *a little bit*, 2 = *somewhat*, 3 = *very much*, 4 = *extremely*).

1. Fear of embarrassment causes me to avoid doing things or speaking to people.
2. I avoid activities in which I am the center of attention.
3. Being embarrassed or looking stupid are among my worst fears

Note. Total score derived from summing each item, with higher scores indicating greater social anxiety.

Appendix A12

The Depression Anxiety Stress Subscales (DASS- 21): Lovibond and Lovibond (1995).

*Directions: "*Please read each statement and indicate how much the statement applied to you **over the past week.** There are no right or wrong answers. Do not spend too much time on any statement."

(Responses are given on a 4 point Likert scale, where 0 = *Did not apply to me at all*, 1 = *Applied to me to some degree, or some of the time*, 2 = *Applied to me to a considerable degree or a good part of time*, and 3 = *Applied to me very much or most of the time*).

1 I found it hard to wind down (s)

2 I was aware of dryness of my mouth (a)

3 I couldn't seem to experience any positive feeling at all (d)

4 I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion) (a)

5 I found it difficult to work up the initiative to do things (d)

6 I tended to over-react to situations (s)

7 I experienced trembling (e.g. in the hands) (a)

8 I felt that I was using a lot of nervous energy (s)

9 I was worried about situations in which I might panic and make a fool of myself (a)

10 I felt that I had nothing to look forward to (d)

11 I found myself getting agitated (s)

12 I found it difficult to relax (s)

13 I felt down-hearted and blue (d)

14 I was intolerant of anything that kept me from getting on with what I was doing (s)

15 I felt I was close to panic (a)

16 I was unable to become enthusiastic about anything (d)

17 I felt I wasn't worth much as a person (d)

18 I felt I was rather touchy (s)

19 I was aware of the action of my heart in the absence of physical exertion (e.g. sense of hea
rate increase, heart missing a beat) (a)

20 I felt scared without any good reason (a)

21 I felt that life was meaningless (d)

Note. Items marked with (d) comprise the depression subscale items marked with (a) comprise the anxiety subscale; items marked (s) comprise the stress subscale. Total subscale scores are derived by summing individual items. Higher scores on each subscale indicate greater levels of depression, anxiety, or stress.

Appendix A13

Multidimensional Scale of Perceived Social Support: (Zimet, Dahlem, Zimet, & Farley, 1988).

*Directions: "*We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement:"

(Responses are given on a 7 point Likert scale where 1 = *Very Strongly Disagree*, 2 = *Strongly Disagree*, 3 = *Mildly Disagree*, 4 = *Neutral, 5 = Mildly Agree*, 6 = *Strongly Agree*, and 7 = *Very Strongly Agree)*

1. There is a special person who is around when I am in need.
2. There is special person with whom I can my share joys and sorrows.
3. My family really tries to help me.
4. I get the emotional help and support I need from my family.
5. I have a special person who is a real source of comfort to me.
6. My friends really try to help me.
7. I can count on my friends when things go wrong.
8. I can talk about my problems with my family.
9. I have friends with whom I can share my joys and sorrows.
10. There is a special person in my life who cares about my feelings.
11. My family is willing to help me make decisions.
12. I can talk about my problems with my friends.

Note. Total scores are derived by summing each item. Higher scores indicate a greater level of perceived social support.

Appendix A14

Subjective Wellbeing: Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985).

*Directions: "*Below are five statements that you may agree or disagree with. Indicate your agreement with each item."

(responses are given on a 7 point Likert scale, where 1 = *Strongly disagree*, 2 = *Disagree*, 3 = *Slightly disagree*, 4 = *Neither agree nor disagree*, 5 = *Slightly agree*, 6 = *Agree*, 7 = *Strongly agree*)

1. In most ways my life is close to my ideal.
2. The conditions of my life are excellent.
3. I am satisfied with my life.
4. So far I have gotten the important things I want in life.
5. If I could live my life over, I would change almost nothing.

Note. Total scores are derived by summing each item. Higher scores indicate a greater satisfaction with life.

Social Science Ethics Officer
Private Bag 01 Hobart
Tasmania 7001 Australia
Tel: (03) 6226 2763
Fax: (03) 6226 7148
Katherine.Shaw@utas.edu.au

HUMAN RESEARCH ETHICS COMMITTEE (TASMANIA) NETWORK

UTAS

03 July 2017

Dr Rachel Grieve
Division of Psychology
University of Tasmania

Student Researcher: Anna Wade

Sent via email

Dear Dr Grieve

Re: MINIMAL RISK ETHICS APPLICATION APPROVAL
Ethics Ref: **H0016568 - Mechanisms underpinning social connectedness derived from Facebook**

We are pleased to advise that acting on a mandate from the Tasmania Social Sciences HREC, the Chair of the committee considered and approved the above project on 18 May 2017.

This approval constitutes ethical clearance by the Tasmania Social Sciences Human Research Ethics Committee. The decision and authority to commence the associated research may be dependent on factors beyond the remit of the ethics review process. For example, your research may need ethics clearance from other organisations or review by your research governance coordinator or Head of Department. It is your responsibility to find out if the approval of other bodies or authorities is required. It is recommended that the proposed research should not commence until you have satisfied these requirements.

Please note that this approval is for four years and is conditional upon receipt of an annual Progress Report. Ethics approval for this project will lapse if a Progress Report is not submitted.

The following conditions apply to this approval. Failure to abide by these conditions may result in suspension or discontinuation of approval.

1. It is the responsibility of the Chief Investigator to ensure that all investigators are aware of the terms of approval, to ensure the project is conducted as approved by the Ethics Committee, and to notify the Committee if any investigators are added to, or cease involvement with, the project.

2. Complaints: If any complaints are received or ethical issues arise during the course of the project, investigators should advise the Executive Officer of the Ethics Committee on 03 6226 7479 or human.ethics@utas.edu.au.

3. Incidents or adverse effects: Investigators should notify the Ethics Committee immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.

4. Amendments to Project: Modifications to the project must not proceed until approval is obtained from the Ethics Committee. Please submit an Amendment Form (available on our website) to notify the Ethics Committee of the proposed modifications.

5. Annual Report: Continued approval for this project is dependent on the submission of a Progress Report by the anniversary date of your approval. You will be sent a courtesy reminder closer to this date. **Failure to submit a Progress Report will mean that ethics approval for this project will lapse.**

6. Final Report: A Final Report and a copy of any published material arising from the project, either in full or abstract, must be provided at the end of the project.

Yours sincerely

Katherine Shaw
Executive Officer
Tasmania Social Sciences HREC

A PARTNERSHIP PROGRAM IN CONJUNCTION WITH THE DEPARTMENT OF HEALTH AND HUMAN SERVICES

Appendix B1

Ethics Approval Letter.

Recruitment PowerPoint Slide.

Do you use Facebook? Are you over the age of 18?

You are invited to participate in a study on how people feel connected with others on Facebook: *Mechanisms Underpinning Social Connectedness derived from Facebook*

Ethics approval number: H0016568

The study will involve completing an online survey asking a series of questions about certain Facebook features.

The survey takes around 25-40 minutes to complete. For more info or to participate, go to: [URL link to be inserted here] or email Anna Wade (awade0@utas.edu.au)

Upon completion of the survey you can go into the running to win **one of six $50 gift vouchers**, *or* **45 minutes research participation** for KHA111/KHA112 students.

Appendix B3

Recruitment Poster.

You are invited to participate in a study on how people feel connected with others on Facebook: *Mechanisms Underpinning Social Connectedness Derived from Facebook*

The study will involve completing an online survey asking a series of questions about certain Facebook features.
The research will be conducted as part of a psychology honours project, supervised by Dr. Rachel Grieve.

The survey, along with further information may be found at the following link, and is expected to take around 25-40 minutes to complete https://www.surveymonkey.com/r/FacebookMechanisms

Upon completion of the survey you can go into the running to win **one of six $50 gift vouchers**, *or* **45 minutes research participation** for KHA111/KHA112 students.

Questions? contact Anna Wade (awade0@utas.edu.au).

Ethics approval number: H0016568

https://www.surveymonkey.com/r/FacebookMechanisms Anna Wade: awade0@utas.edu.au
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Appendix B4

Online Information Sheet.

Invitation

You are invited to participate in a study investigating how Facebook members experiences social connectedness from a variety of features within the social networking site. The study is being conducted as part of an Honours project by Anna Wade under the supervision of Dr. Rachel Grieve in the School of Medicine (Psychology) at the University of Tasmania.

What is the purpose of this study?

Facebook has become central to the way that many people interact with friends and family. Understanding the mechanisms on Facebook that enable feelings of social connectedness is therefore important. This study aims to investigate whether different Facebook features enable distinguishable forms of social connectedness, and their relationship with psychological outcomes like wellbeing and happiness.

Why have I been invited to participate?

You are eligible to participate because you are over the age of 18 and are a member of Facebook. Participation is entirely anonymous. There are no consequences for individuals who do not wish to participate in the study.

What will I be asked to do?

If you decide to participate in this anonymous online study you will be asked to complete a number of questionnaires. The questions will revolve around Facebook use and social connectedness, as well as additional measures of wellbeing. For

example, you will be asked to indicate how much you agree with statements such as "I feel close to people on Facebook", "I am able to connect with other people on Facebook Messenger", "I can talk about my problems with my friends", and your feelings over the past week (for example, "I found it difficult to relax" and "I found it difficult to work up the initiative to do things"). All responses you provide will be completely anonymous, and no information that could identify you (such as your name) will be collected. Submitting this survey conforms your consent for the information you have provided to be used in the research. Participation will take around 25- 40 minutes.

Are there any possible benefits from participation in this study?

It is not anticipated that participation in this study will result in any direct benefits to participants. However, first ear psychology students studying Psychology at the University of Tasmania will be eligible to receive 45 minutes of research participation credit for their participation via SONA. Participants from the gerenal public (and any students who choose not to recive research credit) will have the chance to win one of six $50 cash vouchers. Note that at the end of the questionnaires you will be asked to follow a separate secure link to provide your details to receive research credits, or to go into the draw to with the cash voucher. There will be no way to link your survey answers with your identity, thus your survey answers will be entirely anonymous.

Are there any possible risks from participation in this study?

There are no specific risls anticipated with participation in this study. However if UTAS students particiapting in the study would like to access counselling services,

they can do so by following this link: http://www.utas.edu.au/students/counselling /personal-counseling. Participants from the genreal public should contact their GP or Lifeline. You may also contact the ethical review body for any queires or complaints, provided in the link at the bottom of this page.

What if I change my mind during or after the study?

Participation in this study is entirely voluntary. You may choose to discontinue participation at any point throughout the study without providing an explanation simply by closing the web page. All information you have provided to that point will remain anonymous.

What will happen to the information when this study is over?

All data will be collected using a secure online service (SurveyMonkey). Once the data is transferred for analysis, it will be stored on a password-protected server in the UTAS Psychology Division. Research data will be kept for at least five years from the data of first publication. Following this, the data will be deleted.

How will the results of the study be published?

Relevant findings from this study will be reported in an Honours thesis, and may also be reported in an academic journal, or at an academic conference. As participation is anonymous, no participants will be identified in any publication

What if I have any questions about this study?

For further information please contact Anna Wade (awade0@utas.edu.au) or Dr. Rachel Grieve (rachel.grieve@utas.edu.au).

This study has been approved by the Tasmanian Social Sciences Human Research Ethics Committee (HREC). If you have any concerns or complaints about the conduct of this study, please contact the Executive Officer of the HREC (Tasmania) Network on (03) 6226 7479 or email human.ethics@utas.edu.au. The Executive Officer is the person nominated to receive complaints from the research participants. Please quote ethics reference number [H0016568].

Appendix B5

Online Consent.

Directions: "If you have read and understood all of the above information and you consent to take part in this study please click ‘Yes’. If you do not consent to taking part in this study please click ‘No’ and you will be exited from the survey”.